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# **HATCHERY EVALUATION REPORT**

**Oxbow Hatchery (Idaho) - Spring Chinook**

**September 1996**

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**Integrated Hatchery Operations Team (IHOT)**

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## **Oxbow Hatchery (Idaho) - Spring Chinook**

### **An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures**

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## Executive Summary

This report presents the findings of the independent audit of the Oxbow Hatchery - Spring Chinook program. The hatchery is located in Oregon near the Oxbow hydroelectric facility on the Snake River. The hatchery is used for adult collection of spring chinook and adult collection, spawning, and incubation of summer steelhead.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

### Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*. That document is the source for the performance measures that are the basis of this audit.

### The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

## Oxbow Hatchery - Spring Chinook Results

The Oxbow River facility includes four ponds for adult holding, 6 concrete raceways, and incubation facilities. Oxbow Hatchery began operating in 1962 as part of the Idaho Power's mitigation for fishery losses caused by construction of hydroelectric dams on the Snake River in Hells Canyon.

The Oxbow Hatchery - Spring Chinook program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery did not have a Monitoring and Evaluation Plan in place and was not meeting its adult return goal. The audit found that the hatchery was not in compliance with the turbidity criteria, water chemistry and contaminant monitoring requirements, and alarm facilities, which are all facilities requirements. The hatchery was not in compliance with the requirement to rear or acclimate smolts in the subbasin.

The specific areas in which the Oxbow Hatchery - Spring Chinook program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Conduct (or document) fisheries contribution studies
- Consider installation of flow alarms
- Construct acclimation ponds at Oxbow Hatchery
- Determine if Idaho Power follows IHOT transport protocols
- Develop alarm log
- Develop annual training schedule
- Develop hatchery monitoring and evaluation plan
- Document adult contribution
- Follow IHOT protocols for disinfection of the interior and exterior of transport vehicles
- Install intake screening system
- Monitor DO and TGP
- Provide rearing in the subbasin
- Review iron data and iron criteria
- Review pH data and pH criteria
- Run analysis for contaminants
- Run analysis for missing water chemistry parameters
- Run analysis for nitrite
- Run analysis for turbidity
- Verify that adequate transport systems are available

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

## Facility Description

<b>Name:</b>	Oxbow Hatchery
<b>Stock/Species:</b>	Spring Chinook Summer Steelhead
<b>Operating Agency:</b>	Idaho Department of Fish & Game
<b>Funding Agency:</b>	Idaho Power
<b>Location:</b>	Located in Oregon near the Oxbow hydroelectric facility on the Snake River. The facility is 1,689 feet above sea level.
<b>Address:</b>	Oxbow Hatchery Idaho Department of Fish & Game Box 200 Oxbow, OR 97840
<b>Hatchery Manager:</b>	Ms. Julie Hislop
<b>Phone:</b>	(541) 785-3459
<b>Fax:</b>	
<b>Purpose:</b>	Oxbow Hatchery began operating in 1962 as part of the Idaho Power's mitigation for fishery losses caused by construction of hydroelectric dams on the Snake River in Hells Canyon.
<b>Production Goal:</b>	<p><b>Summer Steelhead</b></p> <p>Trap and spawn adult steelhead; incubate eggs to the eyed stage for transfer to other hatcheries.</p> <p>Rear available excess steelhead eggs to the fry stage for release in the Snake and Salmon River basins.</p> <p><b>Spring Chinook</b></p> <p>Trap and hold returning adults for eventual transfer to the Rapid River Hatchery.</p>
<b>Water Supply:</b>	Water used at Oxbow Hatchery is obtained by pumping it from either the Snake River or an on-site well. The two production pumps produce approximately 6,750 gpm and the two wells produce a total of 200 gpm.

**Facilities:**

Adult Holding:	4 adult holding ponds
Incubation:	24 double stack vertical tray incubators
Early Rearing:	None used
Raceways:	6 raceways (not used)
Rearing Ponds:	
Satellite Facilities:	

## Section 3

# Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (referred to as *IHOT 1995* in this report).<sup>1</sup> The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

## The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and onsite visits. The site visit at the Oxbow Hatchery was conducted on September 17, 1996.

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<sup>1</sup>Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.



The following is the five-step audit process:

1. Information was obtained from headquarters.
2. The hatchery manager was asked to fill out and return the **Audit Form**.
3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.
4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.
5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

## Compliance Status of Oxbow Hatchery - Spring Chinook

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✓) indicates that the specific life-stage is held at this facility.

This section documents the compliance status of the Oxbow Hatchery - Spring Chinook program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

**Table 1 Summary Program Information for Oxbow Hatchery - Spring Chinook**

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Hells Canyon Trap	Oxbow Hatchery	Rapid River Hatchery	Hells Canyon Boat Ramp		
Adult Collection	✓					
Adult Holding		✓	✓			
Spawning			✓			
Fertilization			✓			
Incubation		✓ <sup>(a)</sup>	✓			
green-to-eyed			✓			
eyed-to-hatch			✓			
Rearing						
fry			✓			
fingerlings			✓			
smolts			✓			
Release				✓		

(a) Incubation can occur at Oxbow when Rapid River is at full production.

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin management plan?		✓			Columbia Basin System Planning Production Plan and FERC agreement between Idaho Power and IDFG	
ie hatchery operating under a current hatchery operational plan?		✓			IHOT Operations Plan and Oxbow Hatchery Operations Guidelines	
is it understood by staff?		✓				
is it being followed?		✓				
hatchery monitoring and evaluation plan in place?						
do you have a written monitoring and evaluation plan?				✓		Develop hatchery monitoring and evaluation plan
ult contribution to fisheries, spawning grounds, and hatchery			✓		Review of records	Document adult contribution
ult pre-spawning survival as compared with established goal	✓				Adults transferred to Rapid River	
ry take as compared with established hatchery goal	✓				Adults transferred to Rapid River	
en-egg to eyed-egg survival as compared with established goal	✓				Adults transferred to Rapid River	
d-egg to fry survival as compared with established goal	✓				Adults transferred to Rapid River	
to smolt survival as compared with established goal	✓				Adults transferred to Rapid River	
duction as compared with established goal	✓				Adults transferred to Rapid River	
cent survival (smolt to adult) as compared with established goal	✓				Adults transferred to Rapid River	
nber of eggs, fry, fingerlings, smolts, and/or adults meet basinwide needs	✓				Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Temperature</b>						
Does your water temperature meet the criteria for spawning?	✓				Adults transferred to Rapid River; temperature too warm to spawn	
Does your water temperature meet the criteria for incubation?	✓					
Does your water temperature meet the criteria for rearing?	✓					
<b>Dissolved gases</b>						
Is the oxygen level near saturation?			✓		Review of records/Discussion	Monitor DO
Is the dissolved nitrogen level less than saturation?			✓		Review of records/Discussion	Monitor TGP
<b>Chemistry</b>						
Ammonia (un-ionized)		✓				Run analysis Run analysis Review pH criteria and operations
Carbon Dioxide			✓			
Chlorine			✓			
H				✓		
Copper		✓				
Hydrogen Sulfide		✓				
Iron				✓		Review iron criteria and operations
Manganese		✓				
<b>Turbidity</b>						
Does your turbidity meet the criteria?			✓		Review of records/Discussion	Run analysis

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Alkalinity and hardness</b>						
Does your alkalinity and hardness meet the criteria?		✓			Review of records/Discussion	
<b>Nitrite</b>						
Does your nitrite meet the criteria?			✓		Review of records/Discussion	Run analysis
<b>Contaminants</b>						
Aldrin			✓		No information on river water	Run analysis for contaminants
Dieldrin			✓			
Heptachlor			✓			
Chlordane			✓			
Methoxychlor			✓			
Endane			✓			
Malathion			✓			
Parathion			✓			
<b>Diseases</b>						
What portions of the hatchery have disease-free water?						
Adult holding				✓	Short-term holding at dam prior to transport to Rapid River Hatchery Adult transported to Rapid River Hatchery same as above same as above	
Incubation	✓					
Early rearing	✓					
Rearing	✓					
Others						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Alarm Systems</b>						
Do the following areas have alarms?						
Intake		✓			Adults are shipped to Rapid River Hatchery; little of this program occurs at this hatchery	Consider installation of flow and security alarms
Large rearing ponds and adult holding ponds				✓	Inspection of facilities/ Discussion	
Raceway headboxes and rearing ponds				✓	Inspection of facilities/ Discussion	
Incubation facilities		✓			Inspection of facilities/ Discussion	
Quarantine areas and facilities	✓	✓			Inspection of facilities/ Discussion	
Water treatment systems		✓			Inspection of facilities/ Discussion	Develop alarm log
Security				✓	Inspection of facilities/ Discussion	
Are there outside systems and buzzers in on-site residences?		✓			Discussion	
Are water flow alarms checked daily?		✓			Review of records/Discussion	
Are all other alarms checked weekly?		✓			Discussion	
Is there a log of alarms for emergencies, tests, and maintenance requirements?				✓	Review of records/Discussion	
Are telephone pagers used?			✓		Manual calls as a backup	
<b>Adult collection and holding facilities</b>						
Do you meet the adult holding criteria?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Incubation facilities</b>						
Type 1: <u>Fal Incubator stacks</u> (18) Do you have an adequate number of units for the overall program?	✓				Not used for this program	
Type 2: <u>Old Health stacks</u> (6) Do you have an adequate number of units for the overall program?	✓				Not used for this program	
<b>Rearing facilities</b>						
Type 1: <u>Start vats</u> Do you have an adequate number of units for the overall program?	✓				Not used for this program	
Type 2: <u>Raceways</u> Do you have an adequate number of units for the overall program?	✓				Not used for this program	
<b>Screening facilities</b>						
Do you meet the approach velocity criteria?				✓	Inspection of facilities/Discussion	Install intake screening system
Are the fish screens regularly cleaned?				✓	Inspection of facilities/Discussion	
Does the screen mesh meet screen opening criteria?				✓	Inspection of facilities/Discussion	
Are rearing containers double screened for fish that should not be released to adjacent water?	✓				Inspection of facilities/Discussion	
<b>Predator control facilities</b>						
Are your predation control facilities effective?	✓				Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>d storage facilities and quality control</b>					No feeding occurs at this hatchery	
Does the storage of dry/semi-moist/moist foods (dry<12%; semi-moist 12-20%; moist >20% moisture) follow food manufacturer's recommendations?	✓					
Does a regional quality control officer oversee production procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?	✓					
Ensure feed does not contain unwanted drugs or other additives?	✓					
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?	✓					
Are the foods stored and handled according to the following criteria?						
Moist pellets should not exceed 10 °F at point of delivery.	✓					
Moist pellets should be removed from freezer just prior to feeding.	✓					
Do not leave buckets of feed or feed containers outside exposed to light or heat.	✓					
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.	✓					
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	✓					



Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Release facilities</b>						
Do the release facilities ensure that fish are not subjected to adverse conditions?	✓				No fish release from this facility into river	
<b>Pollution abatement facilities</b>						
Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)?	✓				No feeding	
Are pollution abatement facilities operated correctly?	✓					
<b>Transportation facilities</b>						
Are the transport systems adequate to meet IHOT performance measures for transportation practices?			✓		Idaho Power hauls fish	Verify that adequate transport systems are available

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Broodstock selection practices</b>						
Is the donor selection process document attached?	✓				Existing program; does not apply	
Was the donor selection outline followed in selecting the hatchery broodstock?	✓				Existing program; does not apply	
Refer to PM #40 in Genetics Section						
<b>Spawning practices</b>						
Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?	✓				No spawning at this facility	
Refer to PM #42 in Genetics Section						
<b>Incubation practices</b>						
Are specific incubation standards listed in the hatchery operations plan?	✓				No incubation at this facility	
Are incubation practices written?	✓					
Incubation Type 1: _____(see PM #8) Do you meet the loading and flow criteria?	✓					
Incubation Type 2: _____( see PM #8) Do you meet the loading and flow criteria?	✓					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Rearing practices</b>						
Do you have specific rearing standards listed in the hatchery rearing plan?	✓				No rearing at this facility	
Do you have rearing practices written?	✓					
Do you have rearing Unit Type 1: _____ ( (see PM #9)						
Do you meet the density and DI criteria?	✓					
Do you meet the Loading and FI criteria?	✓					
Do you have rearing Unit Type 2: _____ ( (see PM #9)						
Do you meet the density and DI criteria?	✓					
Do you meet the Loading and FI criteria?	✓					
Do you have rearing Unit Type 3: _____ ( (see PM #9)						
Do you meet the density and DI criteria?	✓					
Do you meet the Loading and FI criteria?	✓					
<b>Smolt quality</b>						
Do you produce a high quality smolt?	✓				Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Health management practices</b>						
Are the monthly hatchery monitoring visits being conducted? (PM #26)	✓				Adults transfered to Rapid River	
Are the annual broodstock inspections being conducted? (PM #27)	✓				Adults transfered to Rapid River	
Is there pathogen-free water and are the sanitation procedures being followed? (PM #28)	✓				Adults transfered to Rapid River	
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature				✓	Review of records/Discussion	Adults transported to Rapid River Hatchery
Dissolved gases			✓		Review of records/Discussion	Run analysis for DO and TGP
Chemistry			✓		Review of records/Discussion	Run analysis for missing chemistry parameters
Turbidity			✓		Review of records/Discussion	
Alkalinity and hardness		✓			Review of records/Discussion	
Nitrite			✓		Review of records/Discussion	Run analysis for nitrite
Contaminants			✓		Review of records/Discussion	Run analysis for contaminants
Are rearing standards being followed? (PM #19)	✓				Adults transfered to Rapid River	
Are egg and fish transfer/release requirements met? (PM #31)	✓				Adults transfered to Rapid River	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p><b>Do hatchery performance meet requirements defined in the regional hatchery policies and in basin and hatchery plans for the following areas?</b></p> <p><b>Percent smoltification</b></p> <p>Do you measure percent smoltification?</p> <p>Did you meet the smoltification criteria?</p>	✓				Discussion	
<p><b>Rearing density (prior to release)</b></p> <p>Did you meet the rearing density criteria just prior to release?</p>	✓				See Rapid River Hatchery	
<p><b>Disease condition (at release)</b></p> <p>Did you meet all disease regulations just prior to release?</p>	✓				See Rapid River Hatchery	
<p><b>Release number (at release)</b></p> <p>Did you meet the release number goal?</p>	✓				See Rapid River Hatchery	
<p><b>Size (at release)</b></p> <p>Did you meet the size goal?</p>	✓				See Rapid River Hatchery	
<p><b>Release date (at release)</b></p> <p>Did you meet the release date goal?</p>	✓				See Rapid River Hatchery	
<p><b>Location (at release)</b></p> <p>Did you release the fish at the specified location?</p>	✓				See Rapid River Hatchery	
<p><b>Are fish reared in the subbasin or acclimated in the subbasin?</b></p> <p>Are the fish reared in the subbasin?</p> <p>Are the fish acclimated in the subbasin?</p>				✓ ✓	Discussion Discussion	Provide rearing in the subbasin Construct acclimation ponds near release area
<p><b>Is the release strategy appropriate for the program?</b></p>	✓				See Rapid River Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Transportation facilities</b>						
Do transportation equipment and personnel receive disinfection before and after use?		✓			Discussion	
Is the fish tank interior disinfected using a solution of 100 PPM active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?		✓			Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?			✓		Discussion	Follow IHOT protocols for disinfection of the interior and exterior of transport vehicle
Is the fish transport vehicle (cab) disinfected using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?			✓		Discussion	
Is other equipment disinfected including fish pumps, nets, egg sorters, waders, boots, rain gear, hoses and other equipment using one of the following solutions?		✓			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✓			Discussion	
Do personnel wear protective garments when handling fish eggs or cultural water?		✓			Discussion	
Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?			✓		Discussion	Determine if Idaho Power follows IHOT Transport protocols
Is a daily service inspection completed before starting pump and leaving for the day?			✓		Discussion	Determine if Idaho Power follows IHOT Transport protocols

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Transportation facilities</b>						
Does the fish transport unit receive an inspection prior to loading?			✓		Discussion	Determine if Idaho Power follows IHOT transport protocols
Does a pre-loading inspection covering: tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading fish in the transport unit?			✓		Discussion	Determine if Idaho Power follows IHOT transport protocols
Do hauling criteria include checking the fish 45 minutes to 1 hour after loading ?			✓		Discussion	Determine if Idaho Power follows IHOT transport protocols
When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained at approximately 8 ppm?			✓		Discussion	Determine if Idaho Power follows IHOT transport protocols
Is water temperature in the transportation unit maintained within the 42-48 °F range?		✓			Discussion	
Do fish releasing procedures include the following criteria?			✓			Determine if Idaho Power follows IHOT transport protocols
Releasing the fish at the correct release site or into the correct water body.			✓		Discussion	Determine if Idaho Power follows IHOT transport protocols
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.			✓		Discussion	Determine if Idaho Power follows IHOT transport protocols
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.			✓		Discussion	Determine if Idaho Power follows IHOT transport protocols

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Evaluation practices</b>  Has the hatchery conducted fishery contribution studies?  Determine the requirements for evaluating and improving management programs?  Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?  Develop guidelines that define if the proper stocks of fish are currently being used?  Determine which management units contribute to a specific fishery and the time periods of those contributions?  Determine the relative contributions of the various management units to a specific fishery over the different time periods?				✓   ✓   ✓   ✓   ✓	Discussion  Discussion  Discussion  Discussion  Discussion	Conduct fishery contribution studies



Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>ining practices</b>						
Does the hatchery have a training schedule for its staff?				✓	Review of records/Discussion	Develop annual training schedule
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✓			Review of records/Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✓			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✓			Review of records/Discussion	
Does the hatchery conduct monthly staff meetings?	✓				Only 1 full-time staff	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below?</b>  Conduct visit at least monthly  Monitoring conducted by qualified fish health specialist  Examine a representative sample of healthy and moribund fish from each lot.  Review fish culture practices with hatchery manager.  Report finding and results of necropsies on standard form.  Recommend appropriate drug or chemical treatment.  Summarize fish health status or stock prior to release or transfer to another facility.	✓  ✓  ✓  ✓  ✓  ✓				Only adult collection occurs at this hatchery	
<b>all of the functions of the hatchery yearly monitoring visits being completed as described below?</b>  Annually examine each broodstock for the presence of reportable viral pathogens.  Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i> .  Conduct inspection by or under the supervision of qualified fish health specialist.	✓  ✓  ✓				Adults transferred to Rapid River Hatchery	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Are hatchery sanitation procedures accepted?</b>						
Are there any sources of pathogen-free water, especially for incubation and early rearing?	✓				Only adult collection occurs at this hatchery	
Are the hatchery sanitation procedures understood and being followed as described below?						
Disinfect/water harden eggs in iodophor?	✓					
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?	✓					
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?	✓					
Is equipment used to collect dead fish sanitized prior to its use in another pond and/or lot of fish?	✓					
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✓			Inspection of facilities/ Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?	✓					
Are dead fish properly disposed of?		✓			Inspection of facilities/ Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>water quality parameters being followed?</b>						
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature	✓		✓		Review of records/Discussion	Fish transported to Rapid River
Dissolved gases			✓		Review of records/Discussion	Run analysis
Chemistry			✓		Review of records/Discussion	Run analysis
Turbidity		✓	✓		Review of records/Discussion	Run analysis
Alkalinity and hardness			✓		Review of records/Discussion	
Nitrite			✓		Review of records/Discussion	Run analysis
Contaminants			✓		Review of records/Discussion	Run analysis
io to PM #21						
<b>incubation and rearing standards being followed?</b>						
Are the incubation practices following the IHOT incubation criteria? (PM #18)	✓				No incubation	
Are the rearing practices following the IHOT criteria? (PM #19)	✓				No rearing	
io to rearing practices PM #18-PM #19						
<b>egg and fish transfer/release requirements</b>		✓			Transportation by Idaho Power	
?						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Go to subbasin plan PM #1</p>		✓			Columbia Basin System Planning Production Plan and FERC agreement between Idaho Power and IDFG	
<p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Go to operational plan PM #2</p>		✓			HOT Operations Plan and Oxbow Hatchery Operations Guidelines	
<p>Is hatchery monitoring and evaluation plan in place?</p> <p>Go to hatchery monitoring and evaluation plan PM #3</p>				✓		Develop monitoring and evaluation plan

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Does the hatchery program meet requirements published in the regional hatchery policies and basin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for the following?						
Species protocols (PM #4a)		✓			Review of records/Discussion	
Stock protocols (PM #4a)		✓			Review of records/Discussion	
Broodstock collection location protocols (PM #41)		✓			Review of records/Discussion	
Broodstock numbers protocols (PM #42)		✓			Review of records/Discussion	
Broodstock collection strategy protocols (PM #41)		✓			Review of records/Discussion	
Spawning protocols (PM #42)	✓				No spawning	
Egg-take protocols (PM #42)	✓				No spawning	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>Do the hatchery's performance meet requirements defined in the regional hatchery policies and in the subbasin and hatchery plans for the following areas: percent smoltification, rearing density, disease condition, and the number, size date(s), and location of release?</b>					Releases by Rapid River Hatchery	
Percent smoltification (PM #22a1)	✓					
Rearing density (PM #22a2)	✓					
Disease condition (PM #22a3)	✓					
Number at release (PM #22a4)	✓					
Size at release (PM #22a5)	✓					
Date of release (PM #22a6)	✓					
Location of release (PM #22a7)	✓					
<b>Are fish reared in the subbasin or acclimated in the subbasin?</b>				✓	Discussion	See PM #22b
PM #22b						
<b>Is the release strategy appropriate for the program?</b>	✓				Discussion	
PM #22c						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<b>new programs, has a broodstock collection plan developed?</b>						
Is the broodstock collection plan written?	✓				Existing Program; does not apply	
For a non-captive broodstock program:	✓				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✓				Existing Program; does not apply	
For a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✓				Existing Program; does not apply	
Were full-sib crosses avoided?	✓				Existing Program; does not apply	
Is the broodstock collection plan understood and being followed by staff?	✓				Existing Program; does not apply	
<b>a new program, was the donor selection outline followed in selecting the hatchery broodstock?</b>						
Is a donor selection plan written?	✓				Existing Program; does not apply	
Was the donor selection outline followed in selecting the broodstock?	✓				Existing Program; does not apply	
Was the target stock recommended in the donor selection process actually used?	✓				Existing Program; does not apply	



Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
Is the broodstock collection plan written?		✓				
Does the broodstock collection plan follow the guideline:						
Was an unbiased, representative sample collected?		✓			Discussion	
Was the recommended number of broodstock collected?				✓	Discussion	Improve adult returns
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✓			Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Was the appropriate number of spawners, male/female ratio, and fertilization protocols used?					Spawning at Rapid River Hatchery	
Are the spawning protocols written?	✓					
Are daily or weekly spawning logs available?	✓					
Was the appropriate number of spawners used?	✓					
Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?	✓					
Was the sex-ratio within the limits given in the performance standards?	✓					
Were the fertilization protocols followed?	✓					
If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?	✓					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Where a genetics monitoring and evaluation program is available?	✓				See Rapid River Hatchery	
Does the plan address the following elements listed in HOT:						
Does the program have elements needed to meet evaluation goals 1-4?	✓					
Has a qualified geneticist reviewed and endorsed the program (goal 5)?	✓					
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?	✓				Discussion	
Is the program understood and followed by staff?		✓				

## Section 4

# Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

**The Five Types of Remedial Actions**

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

## Remedial Actions at Oxbow Hatchery - Spring Chinook

This section presents the corrective actions required to bring the Oxbow Hatchery - Spring Chinook program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ( $\pm 40\%$ ).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

**Table 3. Remedial Actions Required at Oxbow Hatchery - Spring Chinook**

Remedial Action Required	Cost	PMs <sup>1</sup>
<b>Type 1</b> - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve adult returns	----	41
<b>Type 2</b> - Remedial actions requiring changes in agency policies or procedures		
Develop hatchery monitoring and evaluation plan	----	3
Document adult contribution	----	4a
Verify that adequate transport systems are available	----	15
Follow IHOT protocols for disinfection of the interior and exterior of transport vehicles	----	23
Determine if Idaho Power follows IHOT transport protocols	----	
Conduct (or document) fisheries contribution studies	----	24
Develop annual training schedule	----	25
<b>Type 3</b> - Remedial actions requiring changes in monitoring coverage or interval		
Monitor DO and TGP	----	5b
Run analysis for missing water chemistry parameters	----	5b
Run analysis for turbidity	----	5d
Run analysis for nitrite	----	5g
Run analysis for contaminants		5h

<sup>1</sup> PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Remedial Action Required	Cost	PMs <sup>1</sup>
<b>Type 4</b> - Remedial actions requiring significant capital expenditures		
Consider installation of flow alarms	\$10,000	6
Develop alarm log	\$1,000	6
Install intake screening system	\$70,000 - \$100,000	10
Construct acclimation ponds near release area		
1 acclimation pond @ \$1,000,000 per site	\$1,000,000	22b
<b>Type 5</b> - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Review pH data and pH criteria	----	5c
Review iron data and iron criteria	----	5c
Provide rearing in the subbasin	----	22b

<sup>1</sup> PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

## Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Oxbow Hatchery - Spring Chinook program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

**Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:  
Oxbow Hatchery - Spring Chinook**

<b>Year</b>	<b>Fisheries<sup>1</sup> (Broodyear)</b>	<b>Spawning Grounds<sup>1</sup> (Broodyear)</b>	<b>Hatchery<sup>1</sup> (Broodyear)</b>	<b>Total Combined Contribution<sup>2</sup> (Broodyear)</b>	<b>Smolt to Adult Survival (percent)</b>
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery
1989	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery
1990	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery	See Rapid River Hatchery
1991					
1992					

<sup>1</sup> Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

<sup>2</sup> Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

## Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Oxbow Hatchery - Spring Chinook program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in a separate table (Table 5a).

**Table 5. Annual Operating Expenses: Oxbow Hatchery - Spring Chinook**

Hatchery	1993	1994	1995
1. Oxbow Hatchery	\$78,654	\$67,255	\$67,244
2. Rapid River Hatchery	\$564,763	\$729,466	\$386,608
3.			
4.			
5.			
<b>Total Program Costs</b>	\$643,417	\$796,721	\$453,852

The total expenditures for the Oxbow Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery is presented in separate tables (Tables 6a and 6b).

**Table 6. Annual Operating Expenses - Oxbow Hatchery**

Program	1993	1994	1995
1. Spring Chinook	\$78,654	\$67,255	\$67,244
2. Summer Steelhead	\$110,100	\$94,143	\$94,128
3.			
4.			
5.			
<b>Total Hatchery Costs</b>	<b>\$188,754</b>	<b>\$161,398</b>	<b>\$161,372</b>



**Table 5a. Annual Operating Expenses: Oxbow Hatchery - Spring Chinook**  
**Expenditure Occurring at Oxbow Hatchery**

<b>Component</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs <sup>1</sup>	<b>\$188,754</b>	<b>\$161,398</b>	<b>\$161,372</b>
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>			
<b>Source of Funds</b>			
Idaho Power	<b>100%</b>	<b>100%</b>	<b>100%</b>
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	41.67%	41.67%	41.67%
<b>Program Costs</b>	<b>\$78,654</b>	<b>\$67,255</b>	<b>\$67,244</b>

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 6a. Detailed Expenditures at Oxbow Hatchery by Program**

**Spring Chinook**

<b>Component</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs <sup>1</sup>	<b>\$188,754</b>	<b>\$161,398</b>	<b>\$161,372</b>
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>			
<b>Source of Funds</b>			
	<b>100%</b>	<b>100%</b>	<b>100%</b>
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	41.67%	41.67%	41.67%
<b>Program Costs</b>	<b>\$78,654</b>	<b>\$67,255</b>	<b>\$67,244</b>

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

**Table 6b. Detailed Expenditures at Oxbow Hatchery by Program**

**Summer Steelhead**

<b>Component</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>
Personnel Costs			
Operational Costs			
Capital Costs			
Indirect Costs			
Lumped Hatchery Costs <sup>1</sup>	<b>\$188,754</b>	<b>\$161,398</b>	<b>\$161,372</b>
Lumped Third-Party Costs			
<b>Total Hatchery Costs</b>			
<b>Source of Funds</b>			
	<b>100%</b>	<b>100%</b>	<b>100%</b>
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	58.33%	58.33%	58.33%
<b>Program Costs</b>	<b>\$110,100</b>	<b>\$94,143</b>	<b>\$94,128</b>

<sup>1</sup> When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.